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For 1989



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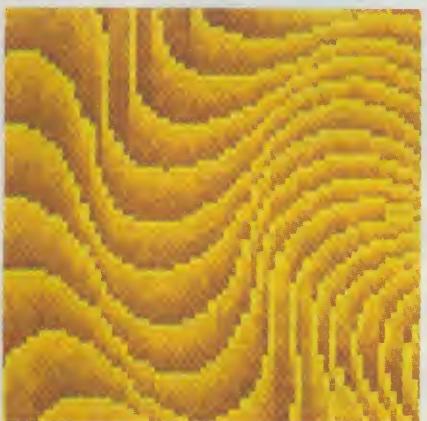
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*Shift your Apple II into  
high gear.*

# TransWarp GS

## THE NEED FOR SPEED

Applied Engineering's TransWarp GS accelerator card is unquestionably the most eagerly awaited third-party Apple II product introduced so far in 1989. With its 2.6-MHz microprocessor, super-hi-res graphics, and Ensoniq sound chip, the II GS can perform computer calisthenics that its predecessors couldn't even dream of. Unfortunately, GS-specific programs often overburden the machine's processing powers, leaving the CPU gasping for breath and users twiddling their thumbs to kill time. TransWarp GS gives the Apple II GS the shot of digital

adrenaline the demanding application programs of today crave.

During the last few months, I've put the TransWarp GS through its paces, using it daily with the strange configurations of software and hardware my job demands. It has performed flawlessly, more than doubling the speed of the II GS. I've become addicted to computing at warp speed with the TransWarp GS. Once you get a taste of the TransWarp GS, you'll wonder how you ever got anything accomplished with your II GS lumbering along at an unaccelerated pace.

### Plug and Play

The TransWarp GS is a board-based accelerator that plugs into an expansion slot and the CPU (central processing unit) socket, making it only slightly



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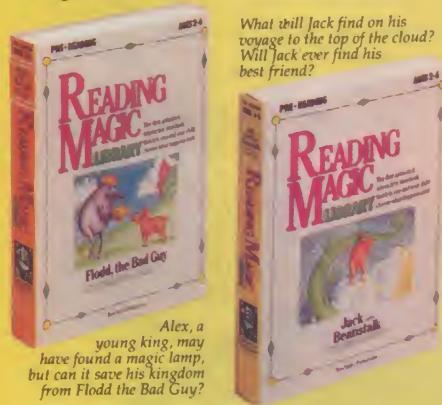
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more difficult to install than most peripheral cards. As long as you proceed with caution and don't zap any components with static electricity, installation should take less than ten minutes.

First remove the 65C816 processor chip from its socket on the GS motherboard, using a flat-blade screwdriver, and store it in a safe place.

Taking care not to bend any pins, plug the stiff-ribbon-cable adapter on the TransWarp GS into the empty CPU socket. Finally, insert the TransWarp GS edge connector into slot 3 or 4.

As most IIGS owners already know too well, plugging a peripheral card into a slot usually overrides the built-in function of that slot. For example, to add a hard-disk drive to your system, you usually use the Control Panel to set slot 7 to Your Card, thereby sacrificing the ability to use AppleTalk. TransWarp GS, however, does not commandeer the function of the slot (built-in text display for slot 3, mouse port for slot 4) into which it is connected.

A plug-and-play device, the TransWarp GS is at your service immediately after installation. No special preboot software is necessary to activate the board. When you turn the computer on, you see a brief animated start-up sequence with the words TRANSWARP GS popping onto the super-hi-res graphics screen, accompanied by the sound of a spaceship blasting into orbit. TransWarp GS then performs a self-test and automatically installs a classic desk accessory (CDA) into memory that allows you to modify the accelerator's operation.

### Warp Speed

Even without the special-effects fanfare, the TransWarp GS makes its presence known almost immediately. Windows pop open and shut instantaneously, lists sort

without hesitation, and cursors flash so fast they appear solid. (For benchmark tests of the speed improvement, see "TransWarp GS Benchmark Results.") I wasn't able to find a single piece of software incompatible with it, nor could I attribute any system problems to the card's presence.

Applied Engineering rates the TransWarp GS at 7 megahertz (MHz), more than double the 2.6 MHz at which Apple rates the IIGS in its fast-system-speed mode and a full seven times quicker than the standard 8-bit Apple II/+e/c.

A 1-MHz microprocessor runs at 1 million cycles per second, which may sound extremely fast, but processor speed is only a rough estimate of computing power. Efficiency, the number of cycles necessary to complete a single operation, is equally important as raw clock speed for comparing relative processor performance.

The TransWarp GS achieves its acceleration with a faster version of the 65816 CPU and memory caching. Simply stated, memory caching is a technique that monitors the data needs of the CPU, storing frequently requested data in relatively fast "cache" memory, from which bytes can be retrieved quickly, as opposed to laborious fetching of data from slow memory whenever it's needed. (For a detailed explanation of memory caching, see "The Zip Chip: Life in the Fast Lane," August 1988.) The Disk Cache NDA that comes with the GS/OS operating system works on the same principle but speeds up disk operations, not processor functions.

### Cruise Control

A TransWarp GS classic desk accessory automatically installs into memory on start-up. Since the CDA loads directly from ROM on the TransWarp GS board, any increase in boot time is imperceptible. Thereafter, whenever you press ⌘-Control-Escape to access the CDA menu, TransWarp GS appears as an option. You can set the speed, change the configuration, initiate a self-test, and run the "About TransWarp GS" demonstration from within this accessory.

The TransWarp CDA menu has three speed settings: Normal, 1.0 MHz; Fast, 2.6 MHz; and TransWarp, 7.0 MHz. There is no way to

## VITAL STATISTICS

### TRANSWARP GS

An Apple IIGS accelerator board that more than doubles the computer's processor speed to 7 MHz

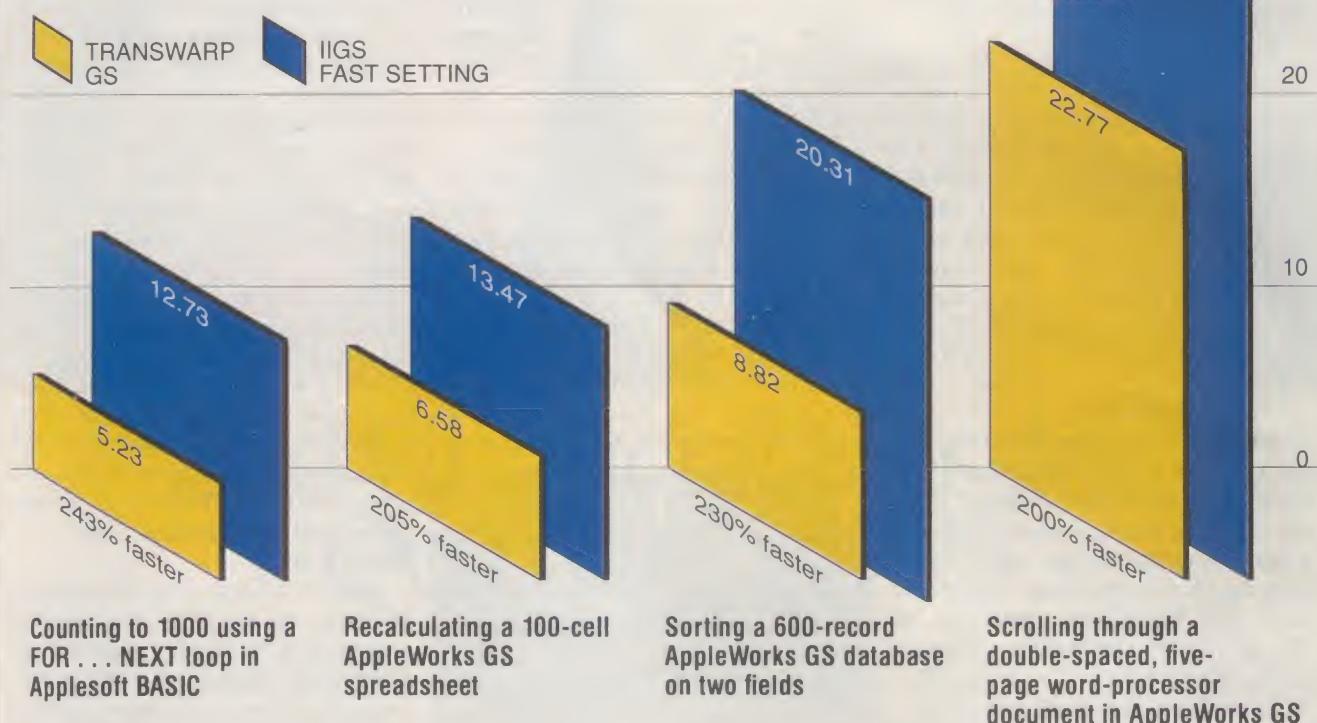
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# TRANSWARP GS BENCHMARK RESULTS

To determine typical speed improvements you can expect from the TransWarp GS accelerator, I conducted several benchmark tests. Using a digital stopwatch accurate to one one-hundredth of a second, I repeated each test three times, first on an Apple IIGS with the system speed set to Fast (2.6 MHz) and then on the same computer with the TransWarp GS set to its fastest mode (7 MHz). I summed the results for each set of tests and then divided by 3 to arrive at the average speeds (in seconds) listed below.

—OWL



set any other intermediate speed. The speed setting in the TransWarp GS CDA works in conjunction with the system-speed setting on the Control Panel. For example, if the system speed is set to Normal on the Control Panel, the GS runs at 1 MHz, regardless of the TransWarp setting.

Under the Configure heading, you can choose to disable the graphics and sound-effects fanfare that occurs during start-up—doing so shaves a few seconds off the system's boot time, but you won't get the satisfaction of hearing your friends ooh and aah when they see the demo.

Also under the Configure heading is an option called AppleTalk/IRQ, which you can set to make the TransWarp GS compatible with time-sensitive devices such as AppleTalk drivers.

The self-test option in the CDA involves a series of diagnostic exams. As the different components and functions of the board are checked out, either the word Passed appears or the accelerator is disabled, allowing the GS to function properly at normal speeds.

#### Speeding Ticket

The only potential drawback of the TransWarp GS is its \$399 price tag, but it's the only IIgs accelerator on the market. Also worth noting: The board was designed to accept faster microprocessors as they become available, so a TransWarp GS running at 10 MHz or more is conceivable. The TransWarp GS additionally comes with a full one-year parts-and-labor warranty.

Whether you want to add a RAM disk, hard-disk drive, or accelerator to your computer, speed comes at a hefty price. RAM disks offer almost

instant load times, and hard-disk drives tack on the convenience of having one place to store all your files, but only an accelerator such as the TransWarp GS increases the raw power of your computer, regardless of the application. It's an improvement you're going to appreciate every time you place your fingers on the keyboard.

If you're like many IIgs owners who have grown disillusioned by the lethargic performance of complex software packages such as AppleWorks GS (see reviews in this issue), check out the TransWarp GS. It is the only hardware product currently available that delivers the power that today's sophisticated software packages desperately need.

Owen W. Linzmayer is A+'s technical editor.

# THE NEED FOR SPEED

# GET YOUR EIGHT BITS' WORTH

If running at 7 MHz with the TransWarp GS sounds enticing but you don't have an Apple II GS, don't despair. Accelerators are available for the entire line of Apple IIs.

## "Classic" TransWarp

The TransWarp from AE is a board-based accelerator that plugs into any expansion slot of an Apple II, II Plus, IIe, or compatible. Of course, since neither the IIc nor IIc Plus can accept peripheral cards, the TransWarp does not work with these systems. For IIe owners loathe to sacrifice the use of a slot, the good news is that the TransWarp works in slot 3 even if there is a card in the auxiliary slot.

The TransWarp uses a technique called memory replacement, rather than memory caching, for acceleration—a brute-force approach to speeding up the II. Instead of using a small amount of fast memory to keep track of commonly requested data, the TransWarp has 256K of fast RAM and a souped-up version of the 65C02 central processor that runs at 3.6 MHz. With this setup, only main memory and the first 64K bank are enhanced. Since it emulates a language card, if you add a TransWarp to an Apple II Plus, the computer will have a total of 128K of bank-switched memory and the ability to run ProDOS, even on a 48K machine.

The TransWarp runs at a maximum speed of 3.6 MHz. This rate is great for crunching numbers, but if you try to save data to disk this quickly, you'll be in trouble, since many input/output devices, such as disk drives, rely on the normal 1-MHz timing of the Apple II. To prevent such problems, the TransWarp card has two banks of DIP switches that you set to determine the speed (1, 1.7, or 3.6 MHz) at which different slots run. They allow you to maximize the efficiency of the acceleration. Once you've configured it for your system, just plug the TransWarp into your computer and forget about it.

## Zip Chip

The Zip Chip (see "Life in the Fast Lane," August 1988) is a microprocessor replacement for the Apple II Plus, IIe, and IIc that runs up to four times faster than the standard 1-MHz 6502/65C02 CPU. To install the Zip Chip, pull the CPU out of its socket on the motherboard and plug in the bulkier Zip Chip in its stead. This operation requires a more delicate touch than does inserting a TransWarp card into a slot, but anyone exercising care can do it.

Since it replaces the microprocessor and doesn't require a slot, the Zip Chip works in the original IIc, giving the machine all the speed of the newer IIc Plus (see the

November 1988 cover story for a complete review of the IIc Plus). Using menu-driven configuration software that comes with the Zip Chip, you can set it to run at 18 different speeds, up to a maximum of 4 MHz. Theoretically, this range of speeds lets you slow down programs to analyze their operation or speed them up for greater performance. In the real world, however, most people just plug the chip in and run it at full throttle all the time.

The Zip Chip uses a 16K memory cache that allows it to speed up a total of 2Mb of RAM, as opposed to only the first 128K with the TransWarp card. This difference may seem significant, but with the notable exception of AppleWorks, few programs take advantage of memory beyond the standard 128K.

## RocketChip

[Editor's Note: Zip Technology, maker of the Zip Chip, has filed suit against Bits & Pieces, maker of the RocketChip, claiming that the RocketChip is based on technology developed under contract to Zip Technology. Bits & Pieces has in turn filed a countersuit. The relative merit of these suits will ultimately be determined by the courts. As of this writing (January 1989), both products are available.]

In physical terms, the RocketChip closely resembles the Zip Chip. It too is a replacement microprocessor for the 6502/65C02 of the Apple II, II Plus, IIe, and IIc. Installation consists of removing the CPU and replacing it with the RocketChip.

The RocketChip uses 16K of cache memory and, in theory, speeds up the first 1.6Mb of RAM. My tests revealed that although the RocketChip worked fine with programs that required 128K or less, its performance was erratic when it was used with AppleWorks and an Apple Memory Expansion Card. AppleWorks loaded itself into the extended memory and appeared to function properly, but when I cre-

## VITAL STATISTICS

### TRANSWARP (VERSION 1.0)

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A replacement microprocessor that quintuples the processor speed to 5 MHz but has operational problems

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**PRICE:** \$189

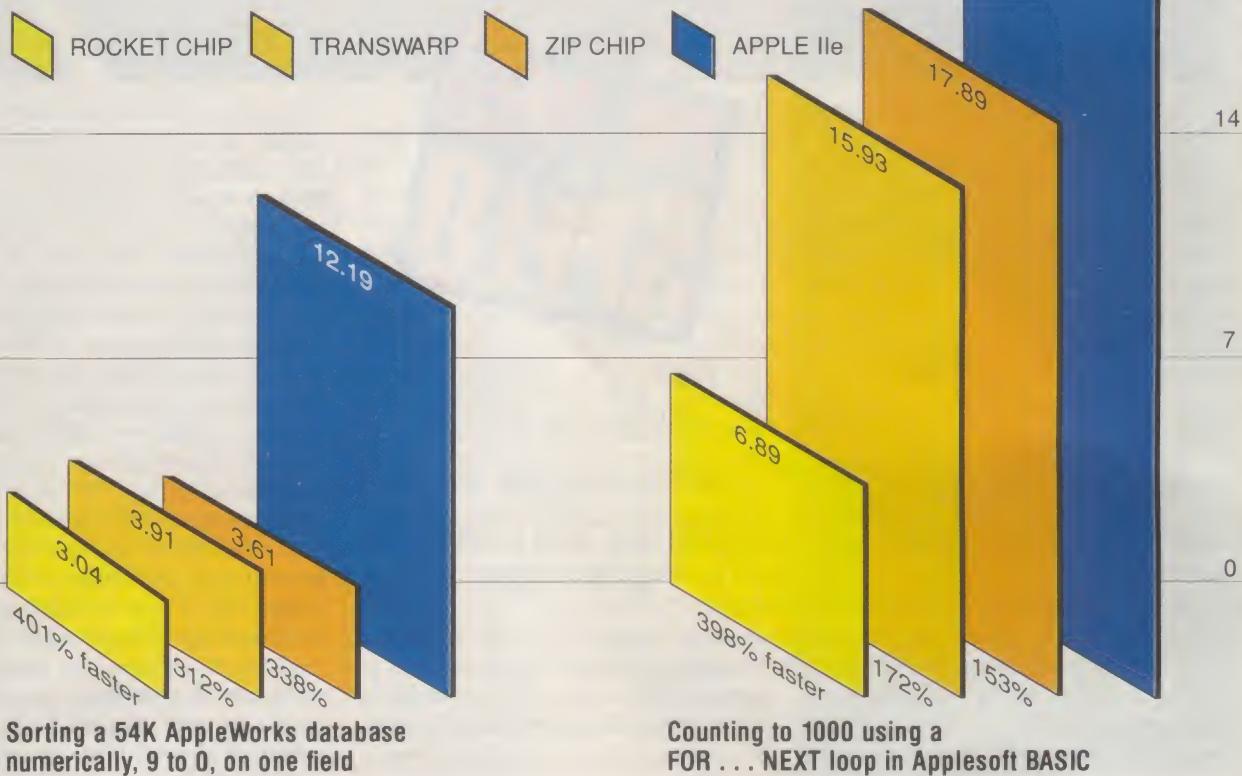
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# 8-BIT ACCELERATOR BENCHMARK RESULTS

To determine typical speed improvements you can expect from the 8-bit accelerators, I conducted several benchmarks tests. With a digital stopwatch accurate to one one-hundredth of a second, I repeated each test on an Apple IIe three times for each accelerator. I summed the results for each set of tests and then divided by 3 to arrive at an average accelerated speed, in seconds.

—OWL



Sorting a 54K AppleWorks database numerically, 9 to 0, on one field

Counting to 1000 using a FOR . . . NEXT loop in Applesoft BASIC

ated a new file or loaded an existing one from disk, the program crashed. I duplicated these disastrous results on separate computers, in a variety of system configurations, using two different RocketChips. The memory cards passed their self-tests, and I couldn't replicate the crashes with a Zip Chip or TransWarp, so I can only conclude that the problem lies with the RocketChip.

The RocketChip normally powers up with slots 5 and 6 running at 1 MHz and all others operating at 5 MHz. If your disk drives are not in the slow slots or you have a problem running a particular card in a fast slot, you must use the provided configuration software to make modifications to the standard start-up state.

The configuration software consists of several files on a flippy disk

(ProDOS on one side, DOS 3.3 on the other) that you run manually from the Applesoft prompt. Using these programs, you can set the system speed at 50 KHz (a 20th of the standard 1 MHz) to 5 MHz. Bits & Pieces promises to provide a self-booting disk with a menu-driven program to all registered owners. Since there is no way to "program" the RocketChip to remember alternative settings, you must run the configuration software every time you turn on the computer. You can, however, activate some functions, such as speed, by holding down different keys on booting.

#### Making the Decision

When you get down to brass tacks with accelerators, the foremost concern is how fast the device makes your computer run under real-world conditions. As our benchmarks show (see "8-Bit Ac-

celerator Benchmark Results"), the Zip Chip and TransWarp operated at roughly the same speed, but the RocketChip outperformed its competitors handily. Unfortunately, because of its problems with extended memory, I cannot recommend the RocketChip.

Deciding between the Zip Chip and the TransWarp depends on which computer you own. If you have a IIc, you are limited to the Zip Chip, since the machine lacks a peripheral expansion slot for the TransWarp card. If you have an Apple II or II Plus, the fact that the TransWarp emulates a language card, giving you extra memory, should weigh heavily in its favor. IIe owners face a more difficult decision, though, since both the Zip Chip and the TransWarp provide similar acceleration.

Owen W. Linzmayer